

Quality Assurance Program

Flanders/CSC's Quality Assurance Program was established to address the eighteen criteria structure of ASME NQA-1 (formally N45.2), "Quality Assurance Requirements for Nuclear Facility Applications". As suppliers of High Efficiency Air Filtration products and services, there are three standards that govern the majority of Flanders/CSC's activities.

1. ASME N509-1989 (reaffirmed 1996)
"Nuclear Power Plant Air-cleaning Units and Components"
2. ASME N510-1989 (reaffirmed 1995)
"Testing of Nuclear Air Treatment Systems"
3. ASME AG-1- 1997
"Code on Nuclear Air and Gas Treatment"

These standards and our customer's specifications invoke many other standards and codes the Flanders/CSC's Quality Assurance Program incorporates as standard practice.

There are a variety of Quality Assurance Programs that manufacturer's implement to ensure product and service quality, two such systems are ISO-9001 and ASME NQA-1.

Abstracts of these programs include:

ISO 9001:2000 specifies requirements for a Quality Management System where an organization

1. Needs to demonstrate its ability to consistently provide product that meets customer and applicable regulatory requirements, and
2. Aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements.

All requirements of this international standard are generic and are intended to be applicable to all organizations, regardless of type, size and product provided.¹

ASME NQA-1: This Standard sets forth requirements for the establishment and execution of quality assurance programs for the siting, design, construction, operation, and decommissioning of nuclear facilities. Nonmandatory guidance is provided in the Appendices. NQA-1 establishes 18 criteria covering all aspects of quality, from purchase of raw materials, to design and testing.²

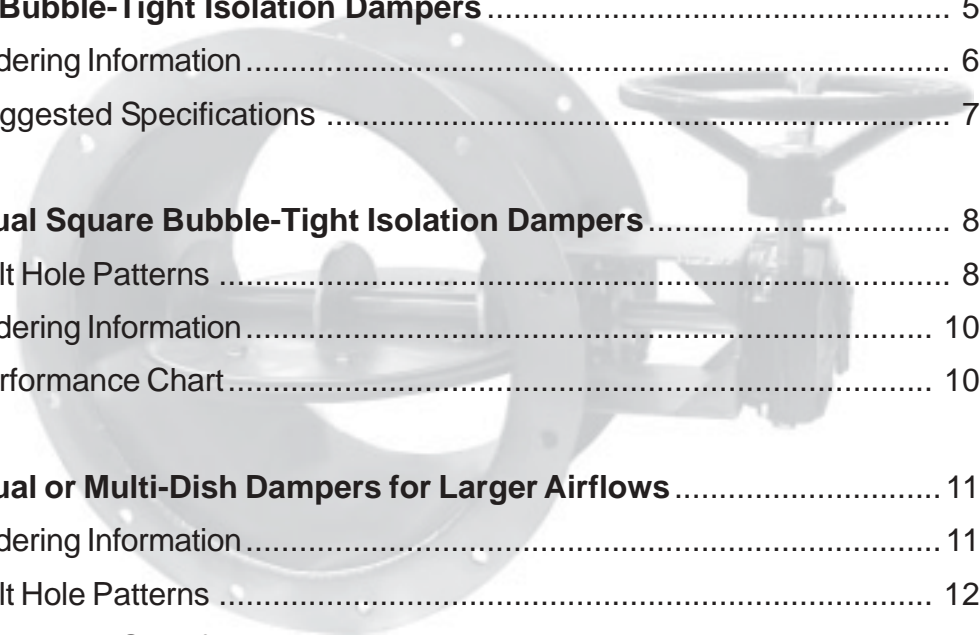
Because ASME NQA-1 applies to the Nuclear Industry where containment and safety are of paramount concern, it is generally seen to establish more checks and balances.

Containment air filtration started out as a critical requirement in the Nuclear industry to protect workers, the public and the environment. Today, containment air filtration is a critical issue in a variety of industries and applications; from pharmaceutical, health care, military, and the original nuclear applications among others. Because of the critical safety requirements of the nuclear industry, ASME N509, ASME N510, and ASME AG-1 are recognized as the standards for design and testing of containment air filtration systems. Each of these standards requires a Quality Assurance Program that meets the requirements of ASME NQA-1.

Flanders/CSC maintains a full scope Quality Assurance Program that meets the requirements of ASME NQA-1, 10 CFR 50 Appendix B, and DOE O 414 1A. Customers that require the stringent application of quality principles that only a mature and developed program can offer routinely audit this Quality Assurance program.

Flanders/CSC has evaluated the possibility of certification to ISO-9001 and determined that an ASME NQA-1 program better meets the critical needs of our customers. Although the two programs are comparable, an ASME study indicates that a ISO-9001 Quality Assurance Program will not meet the requirements of ASME NQA-1 without substantial modification.³

1. ISO.org
2. ASME.org
3. Comparison NQA 1 and ISO 9001 Technical Report, available from ASME.org



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Bubble-Tight Isolation Dampers

Introduction

Flanders/CSC manufactures isolation dampers for effective shut-off and isolation of one or more tiers of filters in a hazardous-duty containment exhaust system. The bubble-tight isolation dampers are Flanders/CSC's top of the line dampers. They are used for isolation of a filter or filter bank primarily during the filter change-out process. Flanders/CSC's isolation dampers are especially designed to provide cost effective isolation of filter banks with high volumes of air.

In a biohazard environment, the dampers enable the air filtration system to be shut-off for decontamination, and/or filterchanging.

A variety of sizes and configurations are available for a wide range of air flows. These dampers are available in both round, square, and rectangular shaped housings, making them adaptable to most applications.

Flanders/CSC's round isolation damper is designed for sealing off and/or controlling airflow in round ducts and pipes. Flanders/CSC's square isolation damper is designed for use as a single damper in ductwork. Rectangular dampers are grouped in multiple configurations to form a damper bank for any size housing configuration. Flanders/CSC guarantees a bubble-tight seal at a differential pressure of 10 inches water gage as specified in ASME N509.

Custom Designs

In addition to the standard designs, many special requirements may be satisfied through options or through custom design. Our engineering and manufacturing personnel have comprehensive experience in the production of equipment and filters for containment filtration systems, and will assist you in designing and specifying a configuration that exactly meets your requirements.

The Flanders/CSC reputation for excellence in the design and fabrication of critical air filtration systems is the result of decades of attention to the toughest environmental and safety standards in the world. Throughout the long development of our containment housings, isolation dampers and in-place test sections, safety has been the first design priority and our track record reflects the confidence of our customers.

Flanders/CSC systems are operating in hundreds of sites, including:

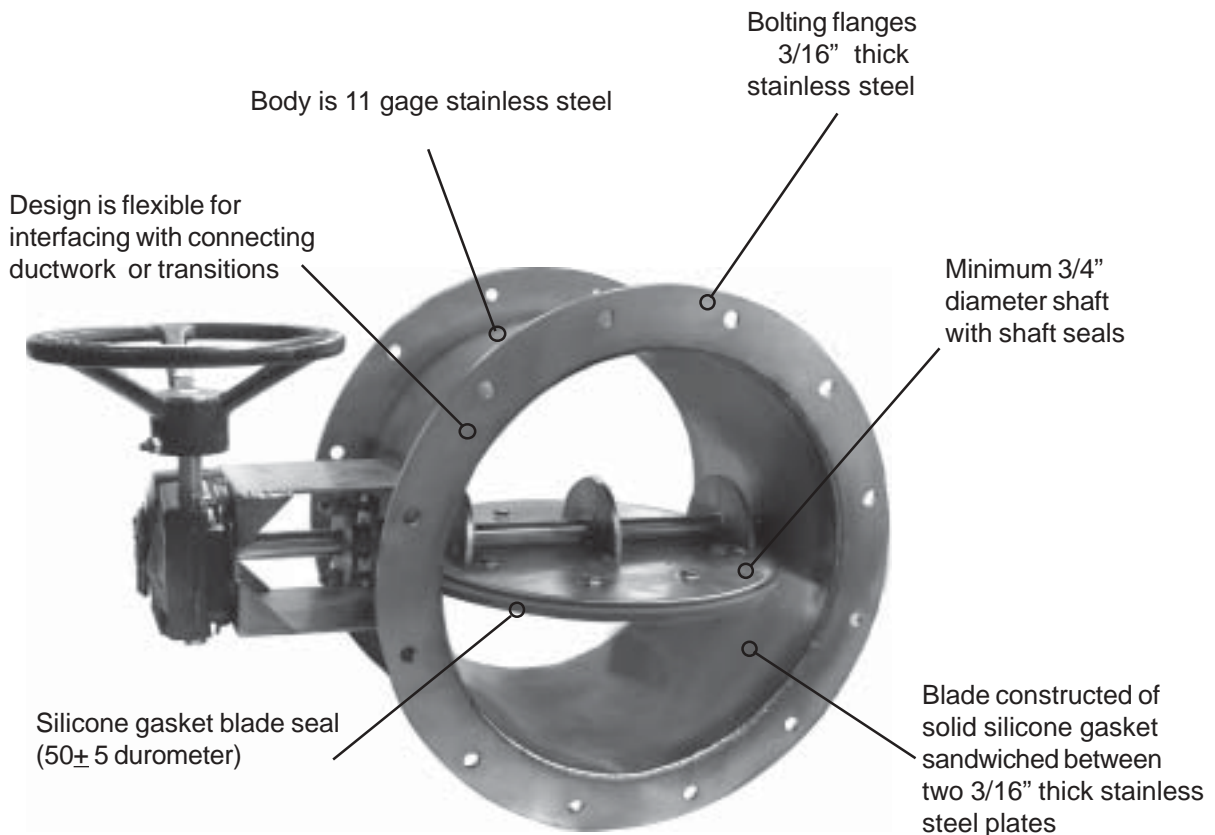
- Hospital Isolation Suites
- Pharmaceutical Facilities
- Microelectronic Sites
- Food Processing Areas
- Genetic and Biotech Labs
- University Campuses
- Industrial Process Exhaust Systems
- Chemical Process Facilities
- Animal Disease Laboratories
- Radioisotope Handling Facilities
- Nuclear Power Plants
- Strategic Nuclear Facilities
- HVAC Systems
- Department of Energy Facilities
- Military Facilities
- Biohazard Facilities

Round Bubble-Tight Isolation Dampers (Flat Blade Type)

Round Bubble-Tight Isolation Dampers

Round bubble-tight dampers are designed to function as both isolation dampers and control dampers. For isolation purposes, the round bubble-tight damper is used for isolation of a filter bank primarily during the filter change-out process. These dampers are bolted (this is recommended) or seal welded on the end of an air flow transition. As a control damper, it is used to regulate the flow of air through the filter system; however, they are not designed for modulating service.

A variety of sizes and configurations are available for a wide range of air flows. Round bubble-tight dampers are furnished with cylindrical housings only, but connecting flanges can change in size and/or shape.

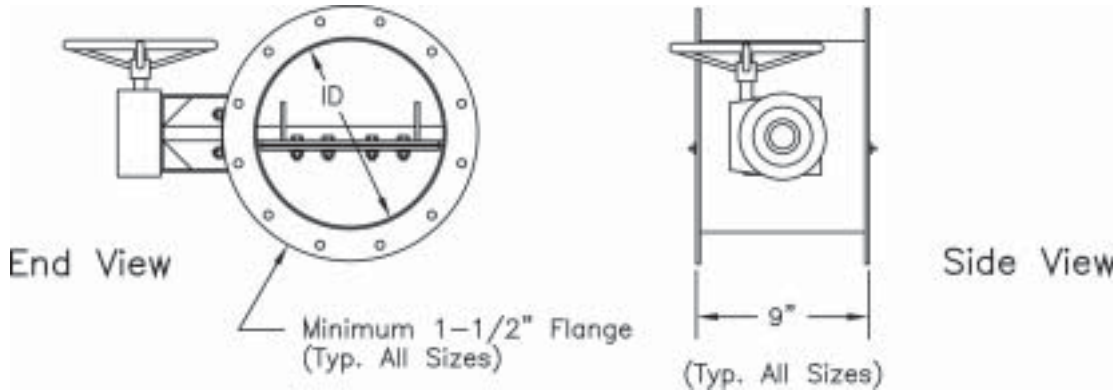


Flanders/CSC's Flat Blade round isolation damper has been tested for 10,000 open/close cycles. This number of cycles could represent more than 40 years of field operation. The damper leakage test result was bubble-tight at 60 inches water gage after the cycle testing.

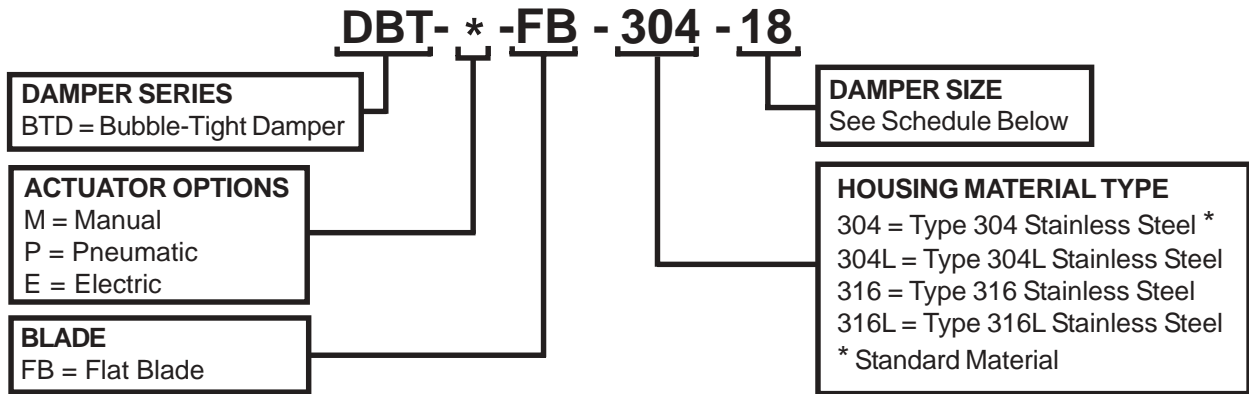
Round Bubble-Tight Isolation Dampers (Flat Blade Type)

Ordering Information

Round Bubble-Tight Isolation Dampers



Model Number Breakdown (Example)



Model No. (See Note 1)	ID	Dia. of Bolt Circle	No. of Bolt Holes
DBT*- FB - 304-6	5 3/4"	8 1/16"	8
DBT*- FB - 30 -8	7 3/4"	10 1/16"	8
DBT*- FB - 304-10	9 3/4"	12 1/16"	12
DBT*- FB - 304-12	11 3/4"	14 1/16"	12
DBT*- FB - 304-14	13 3/4"	16 1/16"	16
DBT*- FB - 304-16	15 3/4"	18 1/16"	16
DBT*- FB - 304-18	17 3/4"	20 1/16"	16
DBT*- FB - 304-20	19 3/4"	22 1/16"	20

Model No. (See Note 1)	ID	Dia. of Bolt Circle	No. of Bolt Holes
DBT*- FB - 304-22	21 3/4"	24 1/16"	20
DBT*- FB - 30 -24	23 3/4"	26 1/16"	24
DBT*- FB - 304-26	25 3/4"	28 1/16"	24
DBT*- FB - 304-28	27 3/4"	30 1/16"	24
DBT*- FB - 304-30	29 3/4"	32 1/16"	28
DBT*- FB - 304-32	31 3/4"	34 1/16"	28
DBT*- FB - 304-34	33 3/4"	36 1/16"	32
DBT*- FB - 304-36	35 3/4"	38 1/16"	32

* Type of Actuator
M=Manual E=Electric P=Pneumatic

- Notes:**
1. Refer to complete model number code above.
 2. Dimensions shown in schedule are Flanders/CSC's standard. Flanders/CSC can manufacture dampers to custom fit any existing round ductwork.
 3. Static pressure through open dampers is negligible with reasonable velocities.

Round Bubble-Tight Isolation Dampers (Flat Blade Type)

Suggested Specifications

The standard construction for model number _____ (insert appropriate model number) shall be as follows. Flanges shall be minimum 1 1/2" wide by 3/16" thick. Factory drilled holes (7/16" diameter) shall be no more than 4" apart as recommended in DOE-HDBK-1169-2003. Nuclear Air Cleaning Handbook, chapter 4, 4-23. The frame material shall be minimum 11 gage unpainted Type 304 stainless steel. All linkage components shall be manufactured from 300- Series stainless steel. Shafts are minimum 3/4" diameter stainless steel rod with shaft seals.

The dampers shall be positive seal, isolation type which shall be bubble-tight at the differential pressure of 10" water gage (for higher design pressures, contact the factory). The blade shall consist of two (2) 3/16" thick type 304 stainless steel plates with a replaceable solid silicone gasket between them. Blade seal shall occur when the gasket seats against the inside of the 11 gage housing wall. The damper shall be all weld design. All "Pressure Retaining" weld joints and seams shall be continuously welded with no pores allowed. Weld joints and seams requiring only intermittent welds, such as reinforcement members, shall not be continuously welded. As a minimum, all weld joints and seams shall be wire brushed and/or buffed to remove heat discoloration, burrs and sharp edges.

The dampers shall be manufactured under a quality assurance program that meets all the requirements of ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities". All welding procedures, welders and welder operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX. All production welds shall be visually inspected per the Flanders/CSC standard procedure number P-122, "Visual Inspection of Welds," which incorporates the workmanship acceptance criteria described in Sections 5 and 6 of ANSI/AWS D9.1-1990, "Specifications for Welding Sheet Metal".

The damper blade shall be tested in the closed position at 10" water gage and shall be bubble-tight when tested in accordance with ASME N509-1996 "Reaffirmed" paragraph 5.9.7.3. The

complete pressure boundary (damper housing) shall be leak tested by the "Pressure Decay Method" in accordance with ASME N510-1995 "Reaffirmed", "Testing of Nuclear Air Treatment Systems", Paragraphs 6 and 7. Pressure readings are recorded once a minute until pressure decays to 75% of the test pressure or for 5 minutes. There shall be a maximum leak rate of 0.0005 CFM per cubic foot of housing volume at 10 inches water gage.

Actuators:

Manual (M): Manual actuators shall be 1/4" turn worm geared actuator with handwheel. Actuator has aluminum base and cover. Rated output torque shall be 2,000 inch pounds up to 22 inch diameter size dampers with a gear ration of 30:1 (7,000 inch pounds on dampers 24" to 36" diameter size, with a gear ration of 40:1). Actuator shall be fully lubricated and self locking to hold at any position, and equipped with a visual indicator to show the damper position.

Options:

- Beacon indicators with end travel limit switches.
- Digital damper position transmitter.

Electric (E): Electric rotary actuator shall have rugged, high torque, integral, single-phase, reversible capacitor run motors and shall be equipped with factory set travel limit switches. The actuator shall also be equipped with motor brake. Specific models and options for various output torque and speed are available. Customer to specify desired options, speeds and voltage.

Options:

- Beacon indicators with end travel limit switches.
- Manual Handwheel override.
- Digital damper position transmitter.

Pneumatic (P): Pneumatic actuator shall be rotary type with flow control valves (i.e. cushions). Customer to specify desired options and available air pressure.

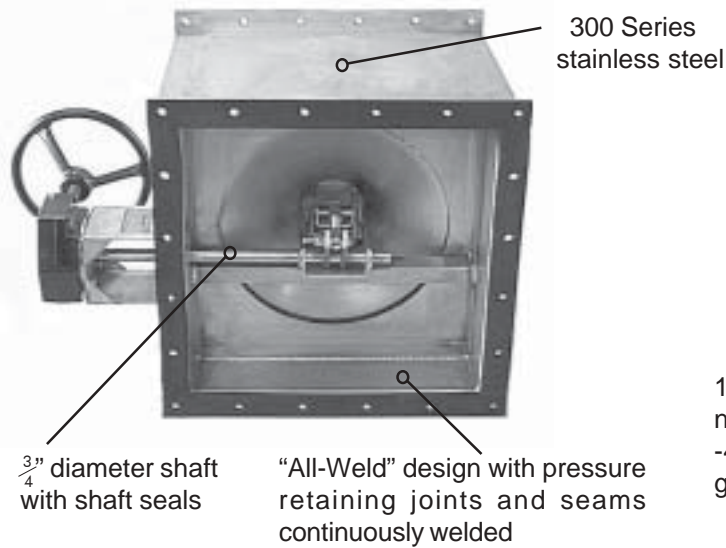
Options:

- Beacon indicators with end travel limit switches.
- Manual Handwheel override.
- Pneumatic & electric operated solenoid/control valves.
- Digital damper position transmitter.
- Standard operating pressure is 80 psi. (other pressures available)

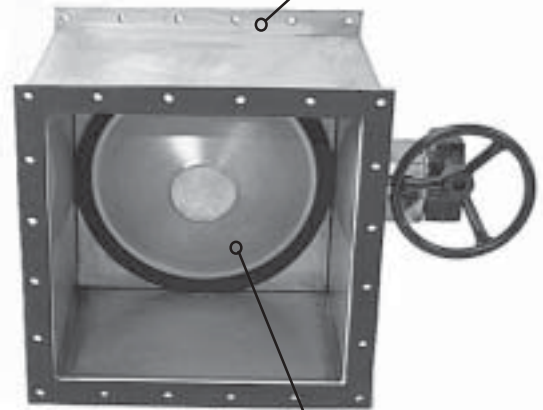
Square Bubble-Tight Isolation Dampers (Dish Type)

Individual Bubble-Tight Isolation Dampers

This design accommodates lower air flows using a single dish damper in a square housing. These dampers are designed to mate directly to transitions. Dampers may be bolted (this is recommended) or seal welded to match the flange configuration. Square single dish dampers are only offered with 12, 16 and 18 inch dishes.



Design is flexible for interfacing with connecting ductwork.

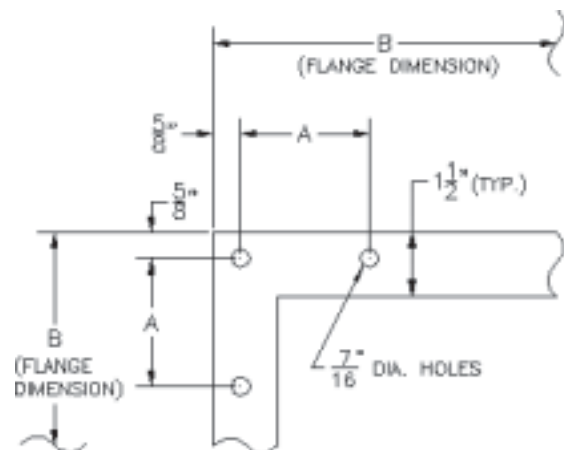


14 Gage stainless steel spun dish with closed-cell, neoprene gasket that withstands temperatures from -40° F to intermittent high of 200° F (high temperature gaskets available)

All Flanders/CSC Isolation Dampers are furnished with factory drilled bolt holes in duct connection flanges to facilitate replacement if required. Bolt hole spacing is in accordance with the recommendation found in chapter 4, 4-23 of the Nuclear Air Cleaning Handbook, "DOE-HDBK-1169-2003". (A maximum bolt spacing of 4 inches is recommended for flanges). Schedule shown is for the three standard square single blade sizes.

Damper Size	Dimension A	Dimension B
12	$3\frac{11}{32}$	18
16	$3\frac{29}{64}$	22
18	$3\frac{51}{64}$	24

Isolation Damper Bolt Hole Patterns



Square Bubble-Tight Isolation Dampers (Dish Type)

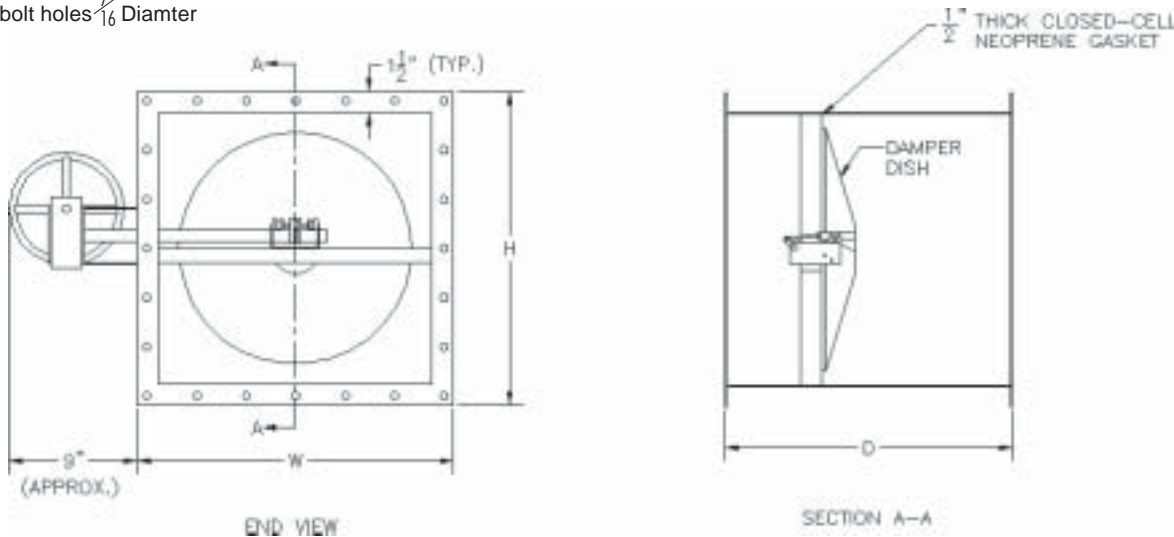
Standard Square Damper Housings Dimensions

Selection of Damper Size

The square bubble-tight dampers (dish type) are offered in three standard sizes. Nominal dish sizes are 12", 16", and 18" diameters. Size refers to the actual dimension of the opening the dish covers when sealing, not the diameter of the

dish. It is important when selecting damper size to achieve optimum velocity and pressure drop within the limits of space, air flow, and interface with connecting duct work. (See Performance Data Chart on page 10.)

Note: All bolt holes $\frac{7}{16}$ " Diameter



Standard Square Damper Housing Dimensions for Single Dish Dampers

Model Number (See Note 1)	Height (See Note 2)	Width (See Note 2)	Depth (See Note 3)
DBT*-1H1W-304-12	18"	18"	16"
DBT*-1H1W-304-16	22"	22"	20"
DBT*-1H1W-304-18	24"	24"	20"

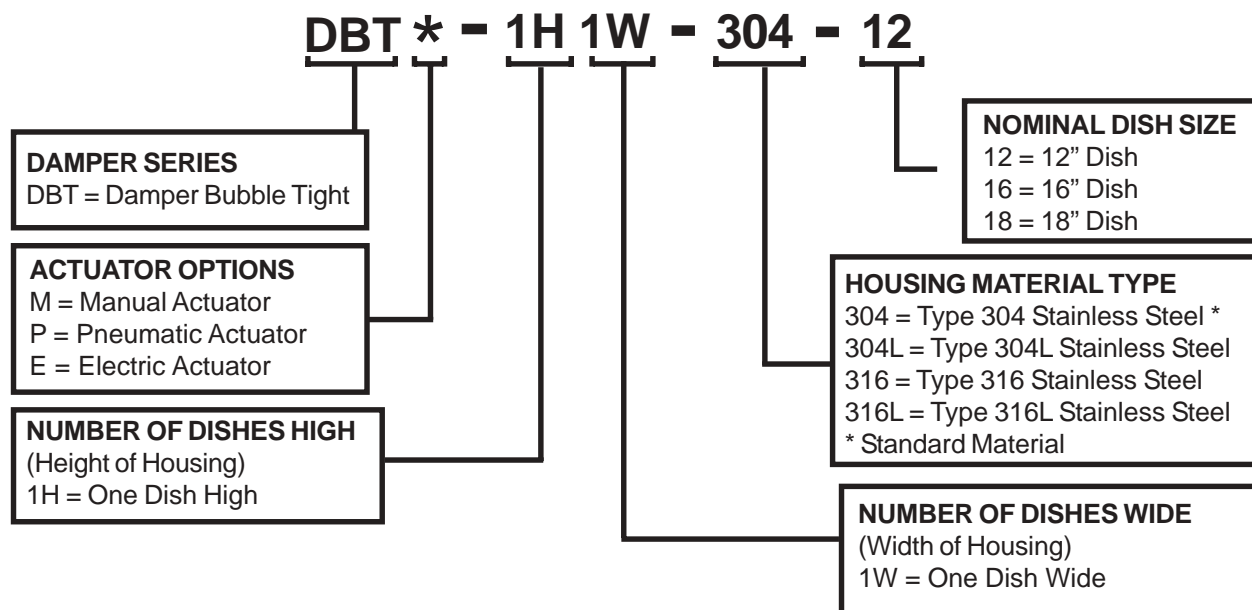
Notes:

1. Refer to complete model number code on Page 10.
2. Height and width dimensions shown are standard, but flange may be extended to allow dampers to mount directly to existing duct work.
3. Damper frame is designed to prevent the damper dish from extending beyond the bolting flange. If dimension is critical, then the frame can be modified allowing the dish to open into duct or plenum.

Square Bubble-Tight Isolation Dampers (Dish Type)

Ordering Information

Model Number Breakdown (Example)



Performance Chart

Damper Face Velocity (FPM) and Pressure Drop (Inches Water Gage) @:

Damper Model Number	Dia. of Damper Opening	Adjusted Area** of Opening (FT ²)	800 CFM		1000 CFM		1200 CFM		1500 CFM	
			VEL.	ΔP	VEL.	ΔP	VEL.	ΔP	VEL.	ΔP
DBT*-1H1W-304-12	12 1/4"	0.635								
DBT*-1H1W-304-16	16 1/4"	1.246	642	0.03	803	0.05				
DBT*-1H1W-304-18	18 1/4"	1.617	495	0.02	618	0.03	742	0.05		

Damper Model Number	Dia. of Damper Opening	Adjusted Area** of Opening (FT ²)	2000 CFM		2500 CFM		3000 CFM		4000 CFM	
			VEL.	ΔP	VEL.	ΔP	VEL.	ΔP	VEL.	ΔP
DBT*-1H1W-304-12	12 1/4"	0.635								
DBT*-1H1W-304-16	16 1/4"	1.246								
DBT*-1H1W-304-18	18 1/4"	1.617	1237	0.13						

Note: Shaded area indicates recommended sizes.

* **Type of Actuator**

** **Area of damper opening minus total area of components**

Rectangle Bubble-Tight Isolation Dampers (Dish Type)

Individual or Multi-Dish Dampers For Larger Air Flow

Rectangular bubble-tight dampers are designed to bolt directly (or be welded) to standard size Flanders/CSC containment filter housings or in-place test housings. This allows for the isolation of tiers on larger systems, and eliminates the need for transitions between dampers and housing.

These dampers are configured to match single housings or multiple height or width housings. (See size chart page 12.)

Note: Multi-high dampers require more than one actuator.



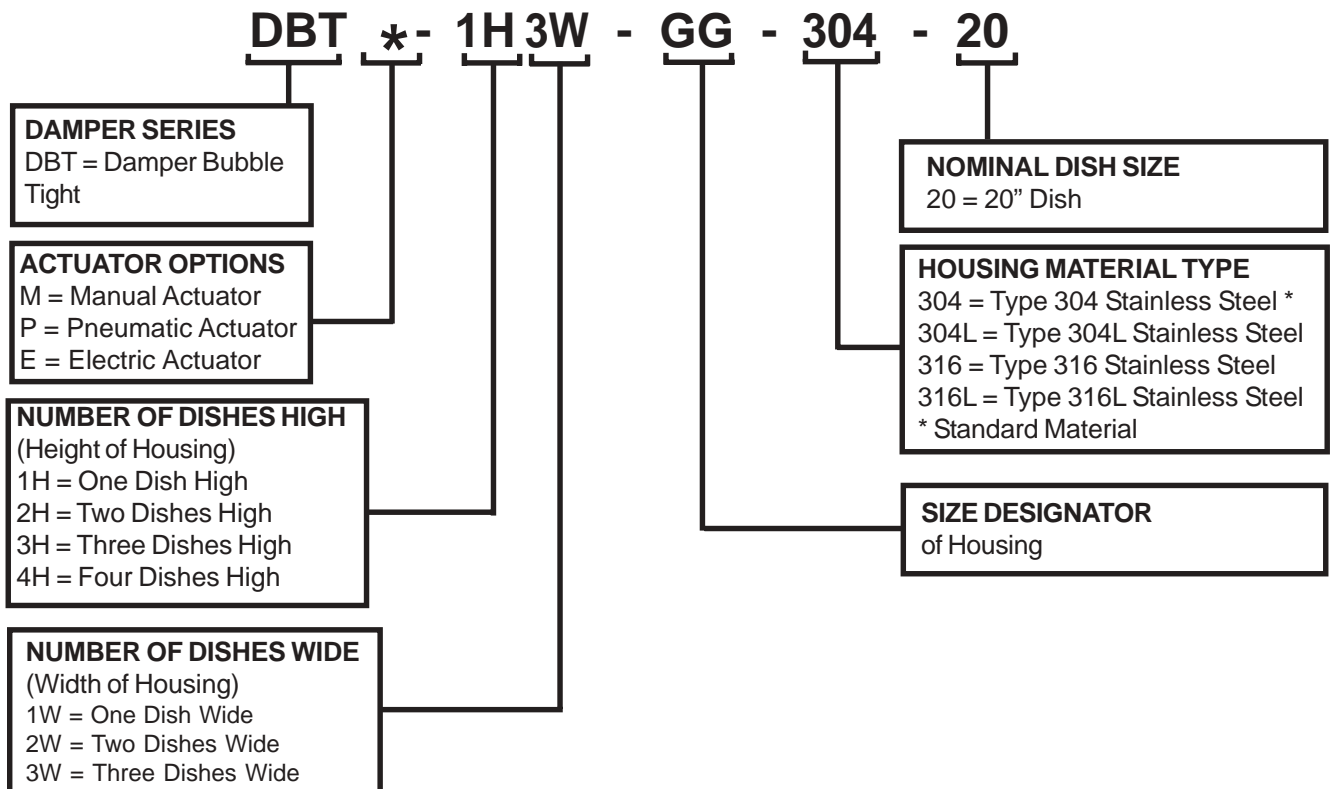
3H3W Multi-Dish Damper Unit--Shown in Closed Position
Shown with Manual Actuators



1H3W Multi-Dish Damper Unit--Shown in Open Position
Shown with Electric Actuators

Ordering Information

Model Number Breakdown (Example)



Rectangle Bubble-Tight Isolation Dampers (Dish Type)

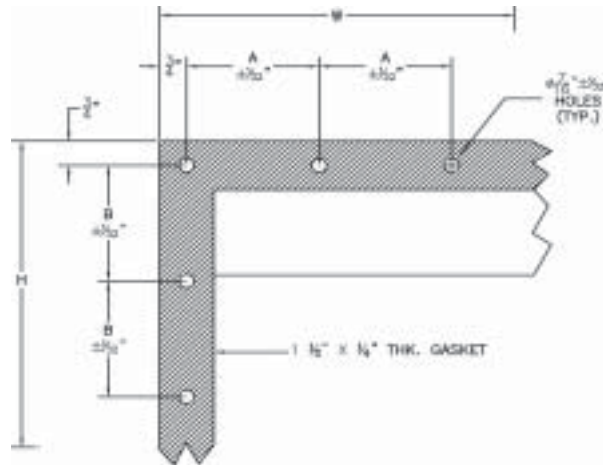
Bubble-Tight Isolation Damper Size Chart

Notes:

1. Refer to complete model number code on Page 11.
2. Height and width dimensions shown are standard, but flange may be extended to allow dampers to mount directly to existing duct work.
3. Damper frame is designed to prevent the damper dish from extending beyond the bolting flange. If dimension is critical, then the frame can be modified allowing the dish to open into duct or plenum.

Model No. (See Note 1)	Height (See Note 2)	Width (See Note 2)	Depth (See Note 3)
DBT*-1H1W-GG-304-20	30"	27"	22"
DBT*-1H2W-GG-304-20	30"	51"	22"
DBT*-1H3W-GG-304-20	30"	75"	22"

Drilled Duct Connection Flanges



Drilled Flange Measurement Chart -

All Dimensions Are Given In Inches

Housing Size	1H1W GG	1H2W GG	1H3W GG
W Width Overall	27"	51"	75"
A Horizontal Spaces	3 ⁴¹ / ₆₄ "	3 ¹³ / ₁₆ "	3 ⁴³ / ₆₄ "
No. of Spaces Between Corner Holes	7"	13"	20"
C Height Overall	30"	30"	30"
B Vertical Spaces	3 ⁹ / ₁₆ "	3 ⁹ / ₁₆ "	3 ⁹ / ₁₆ "
No. of Spaces Between Corner Holes	8"	8"	8"

Bubble-Tight Isolation Dampers (Dish Type)

Suggested Specifications

The standard construction for model number _____(insert appropriate model number) shall be as follows. Flanges shall be minimum 1½" wide. Factory drilled holes ($\frac{7}{16}$ " diameter) shall be no more than 4" apart as recommended in DOE-HDBK-1169-2003. Nuclear Air Cleaning Handbook, chapter 4, 4-23. The frame material shall be 11 and 14 gage unpainted type 304 stainless steel. All linkage components shall be manufactured from 300 series stainless steel. Shafts are minimum $\frac{3}{4}$ " diameter stainless steel rod with shaft seals.

The dampers shall be positive seal, isolation type which shall be bubble-tight at a differential pressure of 10" water gage (for higher design pressures, contact the factory). Dampers shall be constructed with a 11 gage type 304 stainless steel dish shaped blade with a knife edge that seats against a type 304 stainless steel frame. The frame shall have a closed-cell neoprene rubber gasket that creates a gasket-to-knife edge seal. The damper shall be all weld design. All "pressure retaining" weld joints and seams shall be continuously welded with no pores allowed. Weld joints and seams requiring only intermittent welds, such as reinforcement members, shall not be continuously welded. As a minimum, all weld joints and seams shall be wire brushed and/or buffed to remove heat discoloration, burrs and sharp edges.

The dampers shall be manufactured under a quality assurance program that meets all the requirements of ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities". All welding procedures, welders and welder operators shall be qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX. All production welds shall be visually inspected per the Flanders/CSC standard procedure number P-122, "Visual Inspection of Welds", which incorporates the workmanship acceptance criteria described in sections 5 and 6 of ANSI/AWS D9.1-1990, "Specifications for Welding Sheet Metal".

The damper blade shall be tested in the closed position at 10" water gage and shall be bubble-tight when tested in accordance with ASME N509-1996 "Reaffirmed" paragraph 5.9.7.3. The

complete pressure boundary (damper housing) shall be leak tested by the "Pressure Decay Method" in accordance with ASME N510-1995 "Reaffirmed", "Testing of Nuclear Air Treatment Systems", paragraphs 6 and 7. Pressure readings are recorded once a minute until pressure decays to 75% of the test pressure or for 5 minutes. There shall be a maximum leak rate of 0.0005 CFM per cubic foot of housing volume at 10 inches water gage.

Actuators:

Manual (M): Manual actuators shall be $\frac{1}{4}$ " turn worm geared actuator with handwheel. Actuator has aluminum base and cover. Rated output torque shall be 2,000 inch pounds with a gear ratio of 30:1. Actuator shall be fully lubricated and self locking to hold at any position, and equipped with a visual indicator to show the damper position.

Options:

- Beacon indicators with end travel limit switches.
- Digital damper position transmitter.

Electric (E): Electric rotary actuator shall have rugged, high torque, integral, single-phase, reversible capacitor run motors and shall be equipped with factory set travel limit switches. The actuator shall also be equipped with motor brake. Specific models and options for various output torque and speed are available. Customer to specify desired options, speeds and voltage.

Options:

- Beacon indicators with end travel limit switches.
- Manual Handwheel override.
- Digital damper position transmitter.

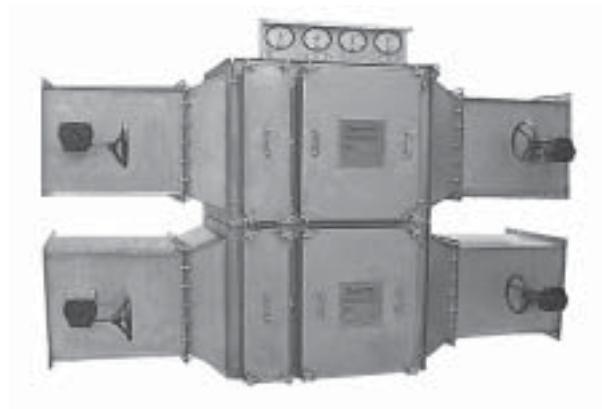
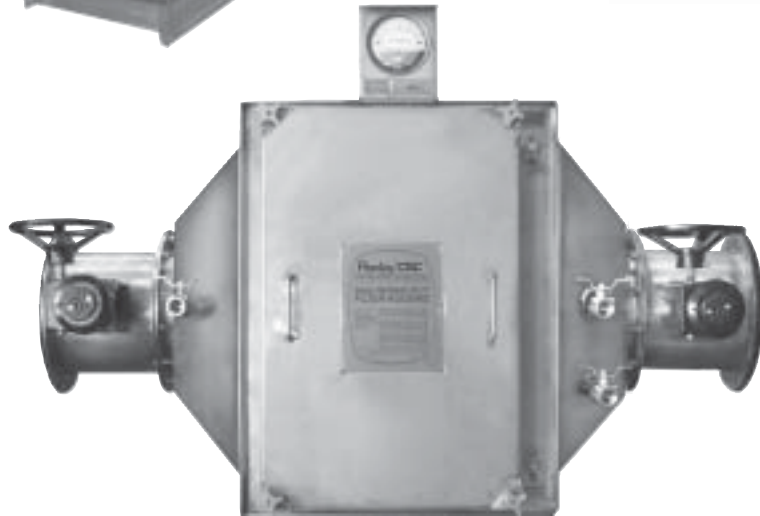
Pneumatic (P): Pneumatic actuator shall be rotary type with flow control valves (i.e. cushions). Customer to specify desired options and available air pressure.

Options:

- Beacon indicators with end travel limit switches.
- Manual Handwheel override.
- Pneumatic & electric operated solenoid/control valves.
- Digital damper position transmitter.
- Standard operating pressure is 80 psi. (other pressures available)

Bubble-Tight Isolation Dampers (Dish Type)

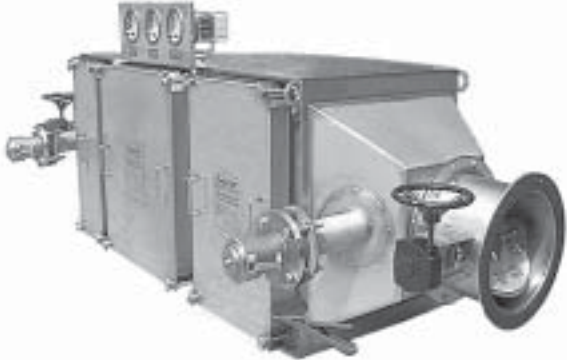
Typical Applications



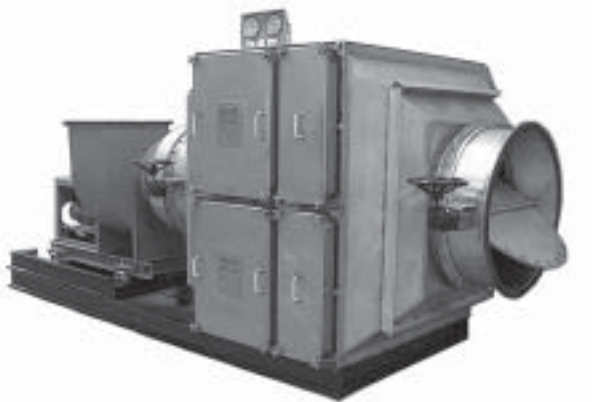
Dampers showing arrangements and actuators which can be used to isolate filtration systems in many different configurations.

Isolation Dampers

Typical Applications



Bubble-tight flat blade isolation dampers used in a bio-containment application at a research university in New York. This design provides isolation for the decontamination process and during filter change.



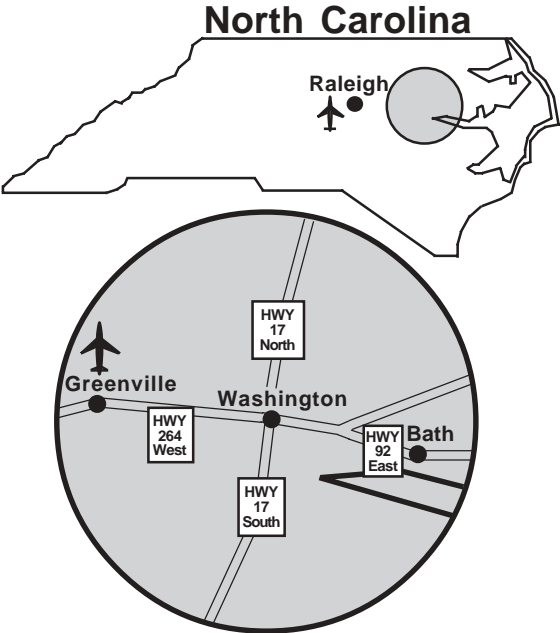
Isolation dampers, upstream and downstream, used to shutdown airflow on a 4000 cfm self-contained filtration system.

Notes:

Contact Information

Quick Reference

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Important Notice

For best results in the application of Flanders/CSC products, it is recommended that the buyer supply complete information about the operating conditions of the ventilation system to Flanders/CSC for prior evaluation. Flanders/CSC does not guarantee that its equipment will operate at the performance levels given on the identification labels or in the catalog specifications under all conditions of installation and use, nor does Flanders/CSC guarantee that suitability of its product for the particular end use which may be contemplated by the buyer. When the system components are supplied to the buyer or his agent for final installation and assembly in the field, it should be under the supervision of factory trained personnel who are equipped to test the installation and certify its performance and conformance to industry accepted specifications. Failure to follow these procedures may result in a compromised installation.



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Representatives of Flanders/CSC® products are located throughout the world.

Your closest representative's office may be found by contacting our manufacturing and sales department.

Represented by: